

WHAT IS CLAIMED IS:

1. A plasma arc torch, comprising:

a first consumable component, said consumable component having a longitudinally extending connection end;

a second component in a coaxial relationship with said first consumable component, said second component having a bore defined therein into which said longitudinally extending connection end extends, said bore including a contact surface defined substantially perpendicular to a longitudinal axis of said torch;

said longitudinally extending connection end of said first consumable component comprising a contact shoulder defined substantially perpendicular to the longitudinal axis of said torch, a locking engagement section configured to engage with said second component and draw said contact shoulder against said contact surface of said second component, and an alignment section extending longitudinally from said engagement section; and

said alignment section having a diameter closely matching that of said bore such that substantially any degree of axial misalignment between said first consumable component and said second component is due to dimensional machining tolerances between an outer circumferential surface of said alignment section and an inner circumferential surface of said bore.

2. The plasma arc torch as in claim 1, wherein said locking engagement section comprises a threaded engagement section between said connection end and said bore, and wherein threads of said threaded

engagement section have a pitch so as to allow for insertion of said alignment
5 section into said bore.

3. The plasma arc torch as in claim 2, wherein said threaded engagement section is disposed adjacent said contact shoulder and between said alignment section and said contact shoulder.

4. The plasma arc torch as in claim 1, wherein said dimensional tolerance is a difference of about .001 to about .008 inches in the diameters of the first consumable component and the second component.

5. The plasma arc torch as in claim 1, wherein said first consumable component comprises an electrode and said second component comprises a cathode body.

6. The plasma arc torch as in claim 1, wherein said first consumable component comprises a nozzle and said second component comprises an anode body.

7. The plasma arc torch as in claim 1, further comprising at least two concentric compressible components disposed circumferentially around said first consumable component and between said first consumable component and another concentric component of said torch, and a pressurized medium flow path
5 directed to a longitudinal location between said compressible components, wherein upon supply of a pressurized medium through said flow path, said compressible components are caused to deform radially outward thereby further centering said first consumable component relative to the longitudinal centerline of said torch.

8. The plasma arc torch as in claim 7, wherein said compressible components comprise O-rings.

9. The plasma arc torch as in claim 7, wherein said consumable component is concentric within said other concentric component.

10. The plasma arc torch as in claim 9, wherein said other concentric component is a different component than said second component.

11. The plasma arc torch as in claim 7, wherein said contact shoulder is disposed between said components and said locking engagement section.

12. The plasma arc torch as in claim 7, wherein each of said compressible components is seated in a respective groove, said grooves having opposite side walls of generally equal depth.

13. The plasma arc torch as in claim 8, wherein said side walls have a depth at least as great as a radius of said compressible components.

14. A plasma arc torch, comprising:

a electrode having a longitudinally extending connection end;

a cathode body in a coaxial relationship with said electrode, said cathode body having a bore defined therein into which said electrode connection end
5 extends, said bore including a contact surface defined substantially perpendicular to a longitudinal axis of said torch and a threaded section;

said electrode connection end comprising a contact shoulder defined substantially perpendicular to the longitudinal axis of said torch, a threaded engagement section configured to engage with said threaded section of said

10 cathode body to draw said contact shoulder against said contact surface, and an alignment section extending rearwardly from said threaded section; and

said alignment section having a diameter closely matching that of said bore such that axial misalignment between said electrode and said cathode body is minimized.

15. The plasma arc torch as in claim 14, wherein said diameter of said alignment section is within about .001 to about .008 inches of a diameter of said bore.

16. The plasma arc torch as in claim 14, wherein said threaded engagement section has a diameter greater than said alignment section.

17. The plasma arc torch as in claim 14, wherein said threaded engagement section is disposed adjacent said contact shoulder and between said alignment section and said contact shoulder.

18. The plasma arc torch as in claim 14, further comprising at least two concentric compressible components disposed circumferentially around said electrode at a location longitudinally spaced from said connection end, and a pressurized medium flow path directed to a longitudinal location between said
5 compressible components, wherein upon supply of a pressurized medium through said flow path, said compressible components are caused to deform radially outward thereby further centering said electrode relative to the longitudinal centerline of said torch.

19. The plasma arc torch as in claim 18, wherein said compressible components are disposed around a location of said electrode that is concentric with at least one insulating body of said torch.

20. The plasma arc torch as in claim 19, wherein said compressible components comprise O-rings.

21. An electrode component for use in a plasma arc torch, said electrode comprising:

an insert end and an opposite connection end;

5 said connection end insertable into a bore in a cathode body and comprising a contact shoulder defined substantially perpendicular to a longitudinal axis of said torch, a threaded engagement section disposed rearwardly of said contact shoulder and configured to engage with a corresponding threaded section of the cathode body, and a longitudinally
10 extending alignment section extending rearwardly from said threaded section; and

wherein said alignment section has a diameter less than that of said threaded section and closely matching that of the cathode body bore such that when said electrode is inserted into the cathode body, axial misalignment between said electrode and said cathode body is minimized.

22. The electrode as in claim 21, wherein said diameter of said alignment section is within about .001 to about .008 inches of a diameter of the cathode body bore.

23. The electrode as in claim 21, wherein said threaded engagement section is disposed between said alignment section and said contact shoulder.

24. The electrode as in claim 21, further comprising at least two concentric compressible components disposed circumferentially around said electrode at a location longitudinally spaced from said connection end.

25. The electrode as in claim 24, wherein said compressible components comprise O-rings.

26. The electrode as in claim 24, wherein each of said compressible components is seated in a respective groove, said grooves having opposite side walls of generally equal depth.

27. The plasma arc torch as in claim 26, wherein said side walls have a depth at least as great as a radius of said compressible components.